Surname and name _____

Lesson 11, 12 and 13. Similarity. Thales. Pythagoras. Solids. Areas and volumes B

1. We want to divide a segment 30 cm long into three parts directly proportional to 3 cm, 8cm and 9 cm. How must be the length of each?

$3+8+9=20$

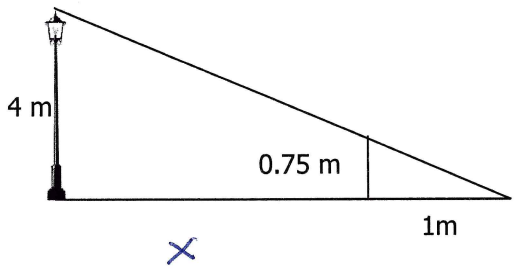
$\frac{30}{20}=\frac{x}{3}=\frac{y}{8}=\frac{z}{9}$

$x=3\cdot 1'5=4'5\ cm$

$y=8\cdot 1'5=12\ cm$

$z=9\cdot 1'5=13'5\ cm$

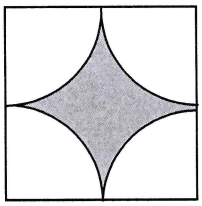
2. A stick 0.75 m long produces a shadow 1m long. Knowing the streetlamp is 4m long, what is the distance between the stick and the streetlamp?



$\frac{4}{0'75}=\frac{x+1}{1}$; $x+1=5'33$

$x=5'33-1=4'33\ m$

3. Calculate the shaded area in the figure knowing that the side of the square is 10 m.

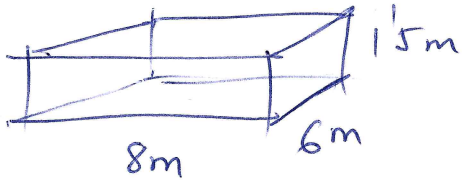


$A_{square} = \ell^2 = 10^2 = 100 m^2$

$A_{circle} : \pi . r^2 = \pi . 5^2 = 78'54 m^2$

$A_{shaded} = 100 - 78'54 = \boxed{21'46 m^2}$

4. A swimming pool is 8 m long, 6 m wide and 1.5 m deep. The water resistant paint needed for the pool costs $6 per square meter.
a: How much will it cost to paint the interior surfaces of the pool?
b. How many liters of water will be needed to fill it?



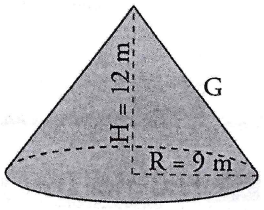
$\$6/m^2$

a) $A_T = 8.6 + 2(8 \times 1'5 + 6 \times 1'5) = 48 + 2.21 = 90 m^2$

$6 \times 90 = \boxed{540\$}$

b) $V = 8.6.1'5 = \boxed{72 m^3} = \boxed{72000 \ell}$

5. Calculate the slant height length (G) for the next cone knowing that the height is 12 m (H) and the radius of the base is 9m (R). Calculate the volume and the surface area.



a) $G^2 = R^2 + H^2$

$G^2 = 9^2 + 12^2 = 81 + 144 = 225$

$G = \sqrt{225} = 15m$

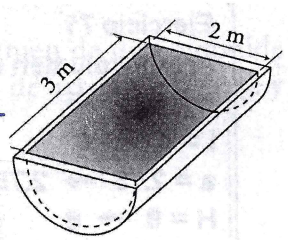
b) $V = \frac{1}{3} A_B \cdot H = \frac{1}{3} \cdot 254 \cdot 12 = 1016\ m^3$

$A_B = \pi \cdot R^2 = 3'14 \cdot 9^2 = 254 m^2$

$A_T = A_B + A_L = 254 + 424 = 678\ m^2$

$A_L = \pi \cdot R \cdot G = 3'14 \cdot 9 \cdot 15 = 424 m^2$

6. Calculate the surface area of this container. That is, the quantity of sheet iron you would need to make it. What is the volume?



a) $A_T = 2A_B + A_L = 2 \cdot 3'14 + 18'84 = 25'12 m^2$

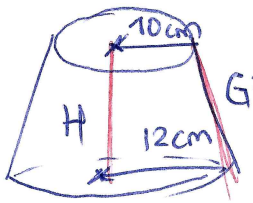
$A_B = \pi \cdot R^2 = 3'14 \cdot 1^2 = 3'14 m^2$

$A_L = 2\pi R \cdot H = 2 \cdot 3'14 \cdot 1 \cdot 3 = 18,84 m^2$

Then, you need $25'12 : 2 = 12'56 m^2$ of sheet iron

b) $V = \frac{1}{2} \cdot A_B \cdot H = \frac{1}{2} \cdot 3'14 \cdot 3 = 4'71\ m^3$ of volume

7. Calculate the lateral area, surface area and volume of a truncated cone with radii of 12 and 10 cm and a **slant height** of 15 cm.



$A_T = A_B + A_b + A_L = 452 + 314 + 1037 =$

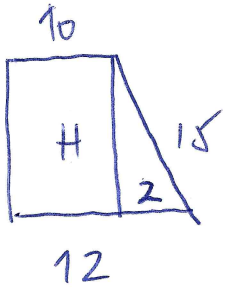
$A_B = \pi \cdot 12^2 = 452 cm^2$

$\boxed{1803 cm^2}$

$A_b = \pi \cdot 10^2 = 314 cm^2$

$A_L = \pi (R+r) \cdot G = \pi \cdot (12+10) \cdot 15 =$

$= \boxed{1037 cm^2}$



$H^2 = 15^2 - 2^2 ; \; H^2 = 221 ;$

$H = \sqrt{221} = 14'9 m$

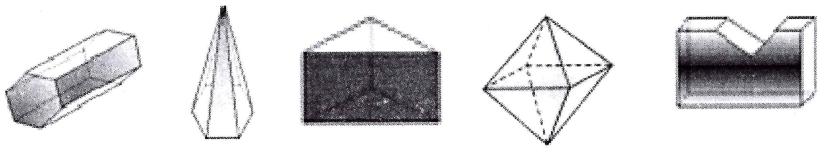
$V = \frac{1}{3} \left(A_B + A_b + \sqrt{A_B \cdot A_b} \right) \cdot H =$

$= \frac{1}{3} \left(452 + 314 + \sqrt{452 \cdot 314} \right) \cdot 14'9 =$

$5'676 cm^3 = \boxed{5'676 dm^3}$

8. Classify the following polyhedrons:

A B C D E



a) You have to write: concave or convex; regular or irregular.

A: convex / regular

B. convex / regular

C: convex / regular

D: convex / regular.

E: concave / irregular

b) What kind of polyhedron are according to the number of faces?

A: octahedron

B: heptahedron

C: pentahedron

D: octahedron

c) What kind of polyhedrons are according to their shapes? (only A to D)

A: hexagonal prism

B: hexagonal pyramid

C: triangular prism

D: octahedron regular.

d) Complete the table and verify Euler's formula?

	Nº of edges	Nº of faces	Nº of vertices	Euler's formula
A	18	8	12	8+12=18+2
B	12	7	7	7+7=12+2
C	9	5	6	5+6=9+2
D	12	8	6	8+6=12+2

9. a) What does Thales theorem state?

Parallels through several straight lines form proportional segments.

b) Write the definition for each word which is referred to a pyramid

1. Apex.

The point where the lateral faces join in a pyramid.

2. Edge.

The segment that is between two consecutive faces.

3. Dihedron angle.

The separation between two planes with a common line.

4. Apothem.

The height of its lateral faces.

c) Could you write the surfaces you obtain by unfolding a frustum of a quadrilateral pyramid?

Two squares and four isosceles trapeziums.

d) What is a cuboid?

It is a polyhedron whose faces are perpendicular in every edge.